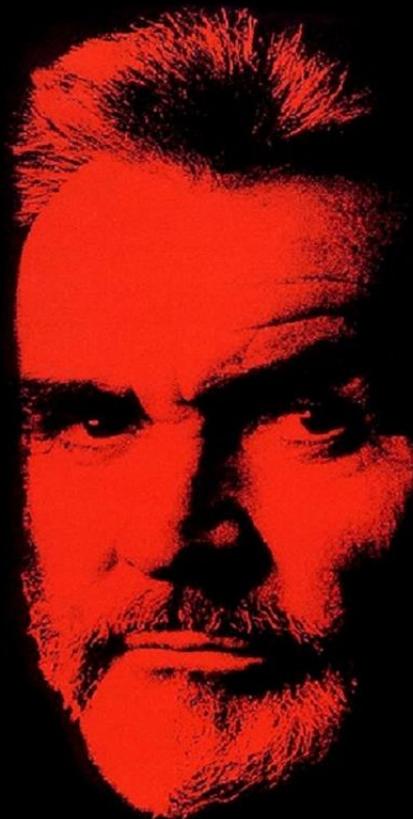


Sediment Sampling on the Trinity River

Angela Kilpatrick
Trinity River Authority
TCEQ SWQM Workshop – November 14, 2018



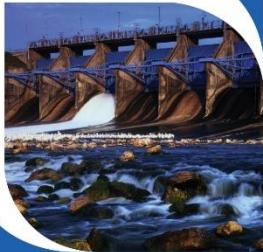
Trinity River Authority Presents



THE HUNT FOR PCBS DIOXINS & FURANS



Background – PCBs, Dioxins, and Furans



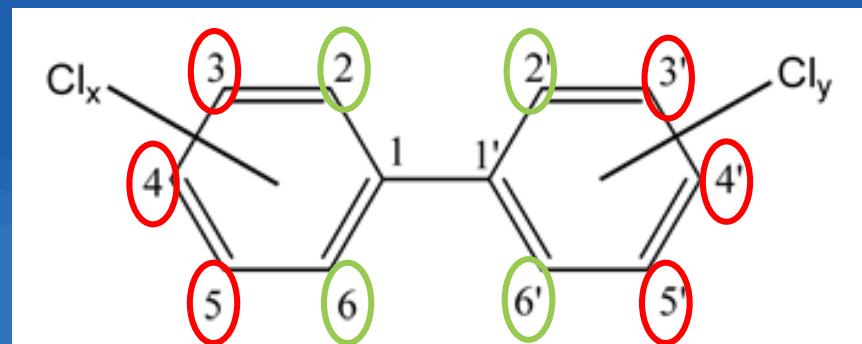
Polychlorinated Biphenyls (PCBs)

- 209 congeners
- 1929- 1977 (1979 ban finalized)
- Sold as mixes – Aroclors
- Properties made them ideal for multiple uses
 - Caulking
 - Plastics
 - Transformers/capacitors
 - Et cetera
- Fat soluble
- Items manufactured before 1977 may still contain PCBs



Polychlorinated Biphenyls (PCBs)

- Biphenyl molecule with 1 to 10 chlorine atoms
 - 2, 2', 6, 6' – ortho positions → Non-planar
 - 3, 3', 5, 5' – meta positions
 - 4, 4' – para positions



[https://clu-in.org/contaminantfocus/default.focus/sec/Polychlorinated_Biphenyls_\(PCBs\)/cat/Overview/](https://clu-in.org/contaminantfocus/default.focus/sec/Polychlorinated_Biphenyls_(PCBs)/cat/Overview/)



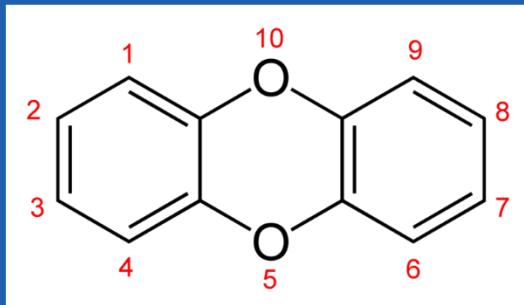
PCB Aroclor/Homolog Properties



Aroclor	A-1016	A-1221	A-1232	A-1242	A-1248	A-1254	A-1260	A-1268
Uses	*Low voltage small can capacitors *Fluorescent light ballasts	*Adhesives and tapes	*Adhesives and tapes	*Medium voltage AC capacitors, low voltage small can capacitors *Fluorescent light ballasts *Adhesives and tapes *Hydraulic fluid for: construction equipment *Oil-based paint and caulk *Plastics *Carbonless copy paper *Heat transfer operations - plastics molding and extrusions, plastics calendaring and coating	*Other electrical equipment including voltage regulators, switches, reclosers, bushings, and electromagnets *Oil used in motors and hydraulic systems *Hydraulic fluid for: high pressure forming presses, forging operations, high temperature presses *Cable insulation *Heat transfer operations - rubber milling	*Lower voltage AC transformers *High voltage AC & DC capacitors *Other electrical equipment including voltage regulators, switches, reclosers, bushings, and electromagnets - specifically high voltage AC switches *Oil used in motors and hydraulic systems *Hydraulic fluid for: forging operations, high temperature presses *Fluorescent light ballasts *Cable insulation *Adhesives and tapes *Oil-based paint and caulk *Plastics *Floor finish *Lost wax casting *Heat transfer operations - heat cells, rubber milling, plastics molding and extrusions, metal molding	*High voltage AC transformers for large industrial uses *Other electrical equipment including voltage regulators, switches, reclosers, bushings, and electromagnets *Oil used in motors and hydraulic systems *Fluorescent light ballasts *Adhesives and tapes *Floor finish	
Homolog Group	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
Monochlorobiphenyl	1.31	47.88	22.27	0.95	0	0	0	0
Dichlorobiphenyl	19.4	35.94	21.19	15.15	2.03	0.49	0.1	0
Trichlorobiphenyl	45.36	6.52	23.47	36.53	24.9	1.31	0.27	0
Tetrachlorobiphenyl	32.82	1.69	23.37	36.07	51.36	26.81	4.39	0.51
Pentachlorobiphenyl	1.16	0.65	4.78	8.73	18.45	44.32	10.56	2.75
Hexachlorobiphenyl	0	1.09	0.61	1.11	2.07	21.85	40.68	2.08
Heptachlorobiphenyl	0	0.43	0.5	0.79	1.48	4.68	33.37	8.32
Octachlorobiphenyl	0	0.06	0.12	0.28	0.45	0.54	9.4	40.93
Nonachlorobiphenyl	0	0	0.02	0.03	0.06	0.03	1.21	37.29
Decachlorobiphenyl	0.01	0.01	0.01	0	0	0.02	0.02	8.12

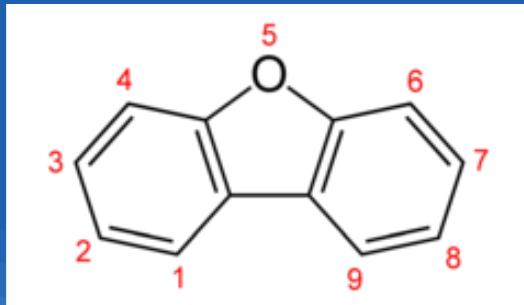
Dioxins & Furans

- Polychlorinated dibenzo-p-dioxins (PCDDs)



2, 3, 7, 8-TCDD

- Polychlorinated dibenzofurans (PCDFs)



- Not intentionally produced



Top 7 Congeners from Combustion and Non-Combustion Sources



Dioxin & Furan Congeners	WHO 2005 TEF	COMBUSTION SOURCES														NON-COMBUSTION SOURCES		
		Municipal Waste Incineration Facilities With Hot-Sided Electrostatic Precipitators	Municipal Waste Incineration Facilities With Dry Scrubbers and Fabric Filters	Medical Waste Incinerators	Hazardous Waste Incinerators	Cement Kilns Burning Hazardous Waste	Cement Kilns Not Burning Hazardous Waste	Industrial Oil-Fired Boilers	Industrial/ Utility Coal Combustors	Industrial/ Wood Combustors	Unleaded Fuel Combustion in Vehicles	Diesel Fuel Combustion in Trucks (tailpipe emissions)	Diesel Fuel Combustion in Trucks (Baltimore Tunnel)	Secondary Aluminum Smelters	Secondary Lead Smelters	Bleached Chlorine Paper Pulp	Technical Pentachlorophenol (Pesticide and disinfectants)	2,4-D Salts and Esters (Broadleaf Herbicide)
2,3,7,8-TCDD	1						3								6	1		
1,2,3,7,8-PeCDD	1															3		2
1,2,3,4,7,8-HxCDD	0.1						6									7		6
1,2,3,6,7,8-HxCDD	0.1															7		3
1,2,3,7,8,9-HxCDD	0.1													5		7		7
1,2,3,4,6,7,8-HpCDD	0.01	3	2	4		4	3	5	6	5	4	4	2	5	3	6	3	
OCDD	0.0003	2	1	3	5		2	1	4	1	1	1	1	4	1	5	1	
2,3,7,8-TCDF	0.1		5		7	2	1	4	7	7	5	5	7		1	2	2	
1,2,3,7,8-PeCDF	0.03					5				7	6					4		4
2,3,4,7,8-PeCDF	0.3					1	5		5	7					3	2	6	4
1,2,3,4,7,8-HxCDF	0.1	4	6	6	3	3	6		3	6	7	7	6	6	3	7		5
1,2,3,6,7,8-HxCDF	0.1	7		7	4	7			4	7	6		7					
1,2,3,7,8,9-HxCDF	0.1																	
2,3,4,6,7,8-HxCDF	0.1	6	7	5	6	6									7			
1,2,3,4,6,7,8-HpCDF	0.01	1	3	2	1		7		2	2	3	3	4	1	5	5	4	1
1,2,3,4,7,8,9-HpCDF	0.01							7									5	
OCDF	0.0003	5	4	1	2		4	2	1	3	2	2	3	2	4		2	

The Congener Profiles of Anthropogenic Sources of Chlorinated Dibenzo-p-Dioxins and Chlorinated Dibenzofurans in the United States

Cleverly, D.; Schaum, J.; Schweer, G.; Becker, J.; Winters, D. 1997. The congener profiles of anthropogenic sources of chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans in the United States. presentation at Dioxin '97, the 17th International Symposium on Chlorinated Dioxins and Related Compounds, held August 25-29 in Indianapolis, IN, USA. Short paper in, Organohalogen Compounds, Volume 32:430-435.

Effects

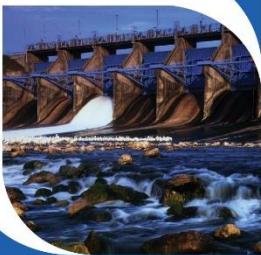
- PCBs
 - Cancer
 - Liver damage
 - Chloracne
 - Respiratory problems
 - Suppressed immune system
- Dioxins/Furans
 - Cancer
 - Reduced hormone levels
 - Chloracne
 - Fetal development
 - Decreased fecundity
 - Suppressed immune system



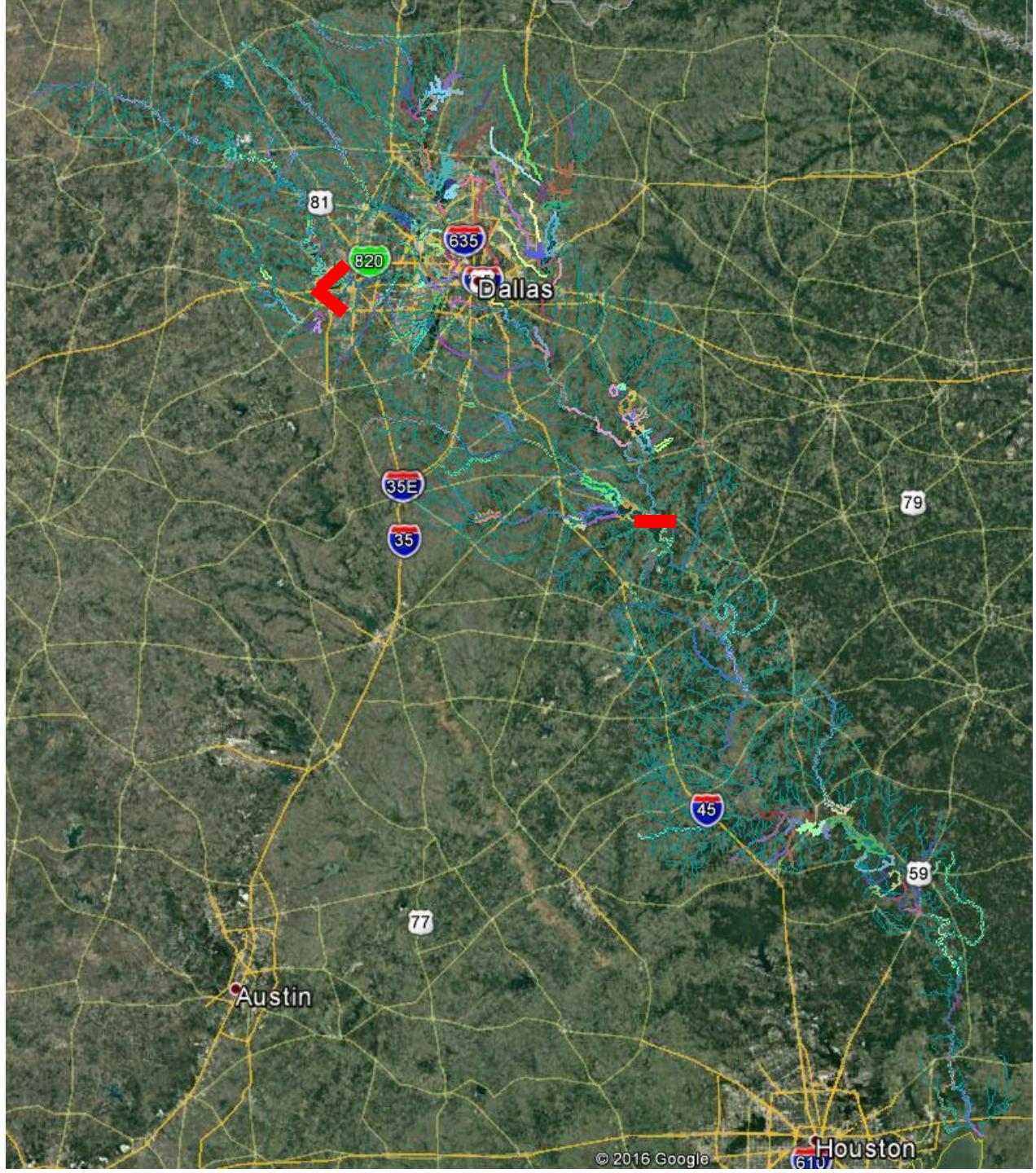
Viktor Yushchenko – 2004 TCDD poisoning



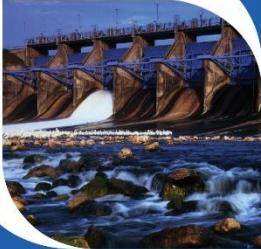
Background – Why are we sampling sediments?



- Existing fish consumption advisories
- December 2015
 - TxDSHS ADV-53
- Hydrophobic
 - Bioaccumulate
 - Biomagnify



The Study



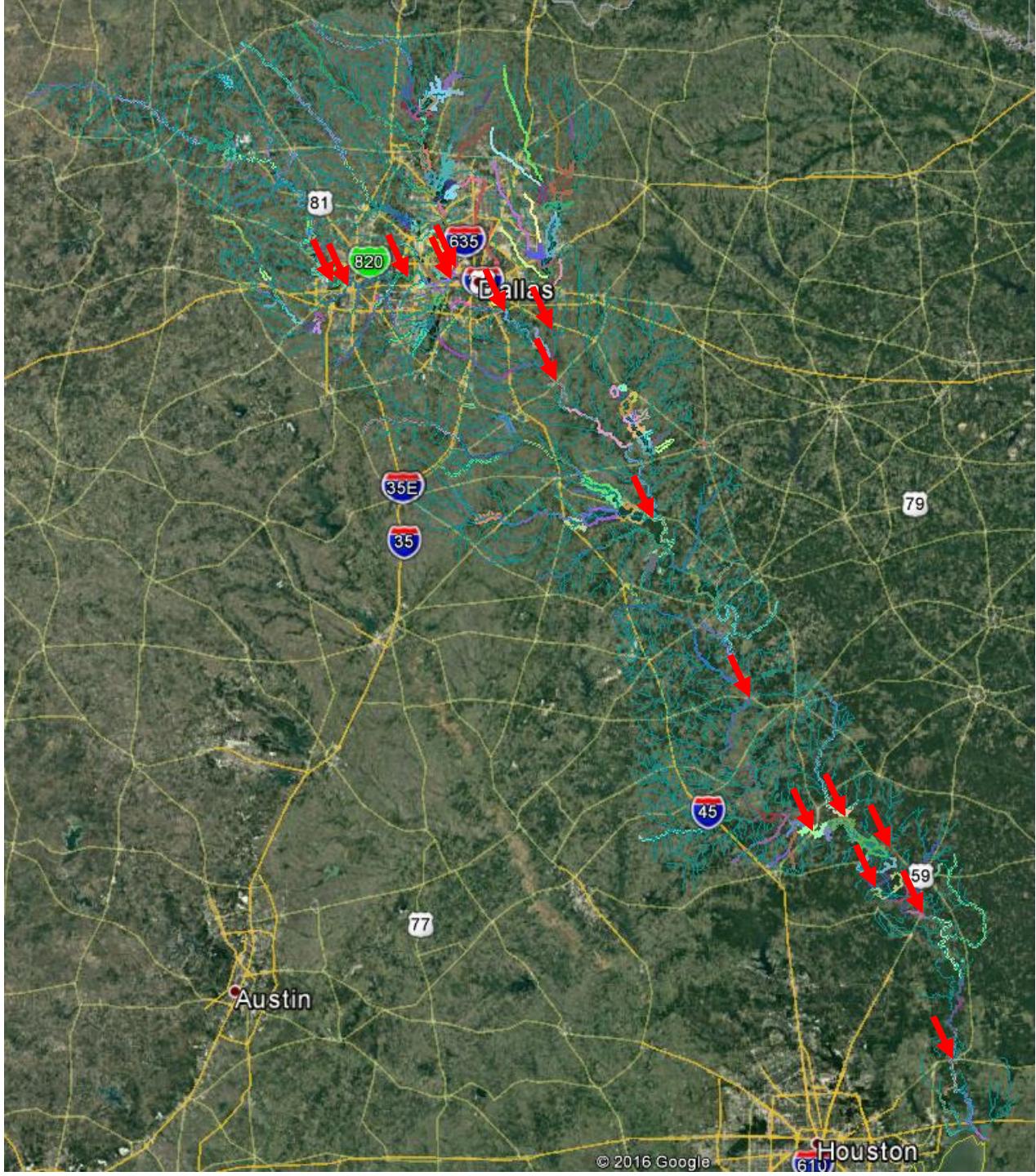
Analyses & Labs

- PCBs/Dioxins/Furans
 - Requires NELAP
 - PCBs - EPA 1668
 - D/F – EPA 8290
 - % Solids
 - Requires NELAP
 - SM 2540-G
 - TOC
 - Requires NELAP
 - SSA/ASA Part 3:34 Walkley-Black
 - Particle Size
 - Sieve
- Eurofins
Lancaster, PA
\$1,103/sample
- Ana-Lab
Kilgore
- \$255/sample
- Subbed to
GCO Labs
Longview

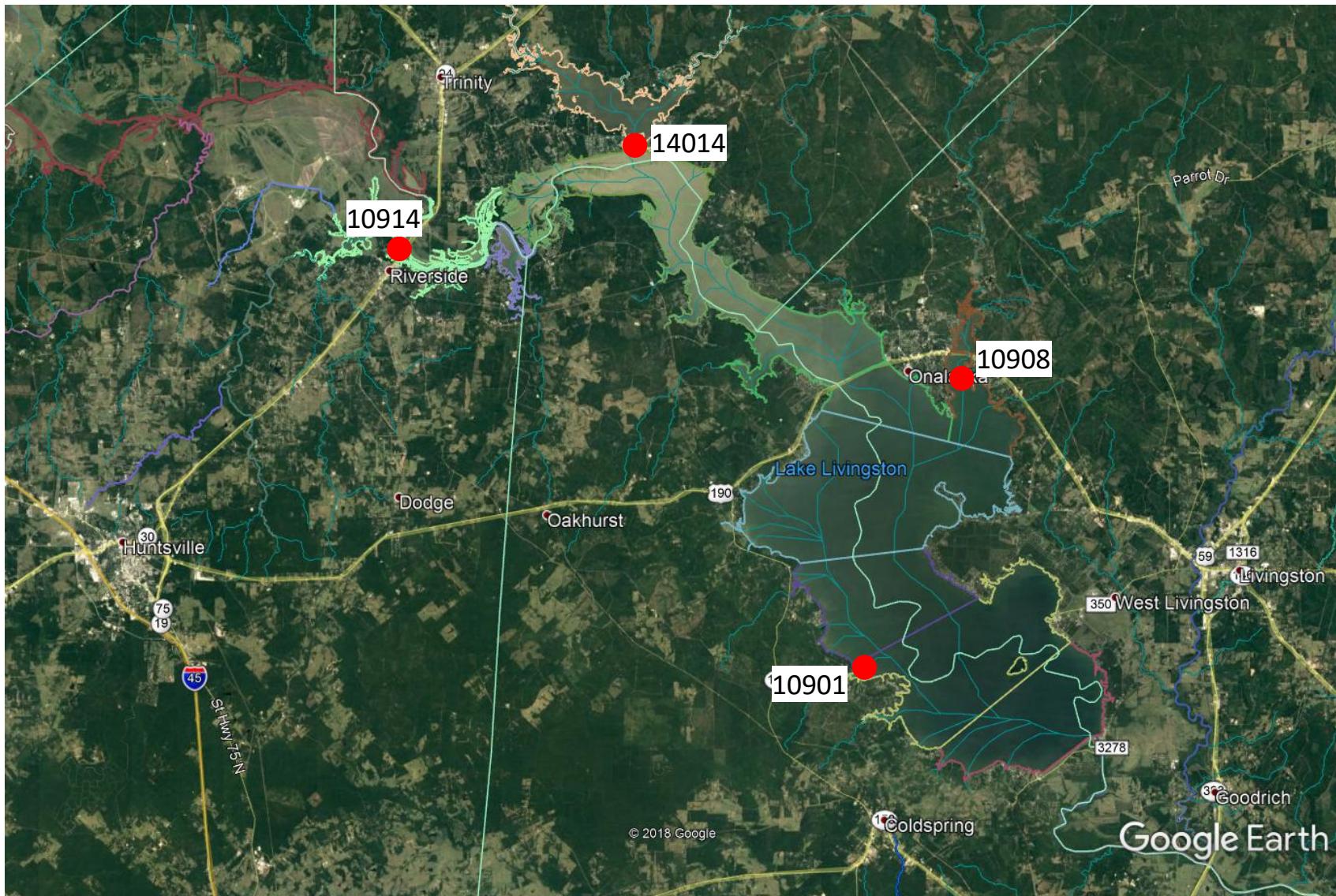


Phase 1 Sites

Phase 1 Sites

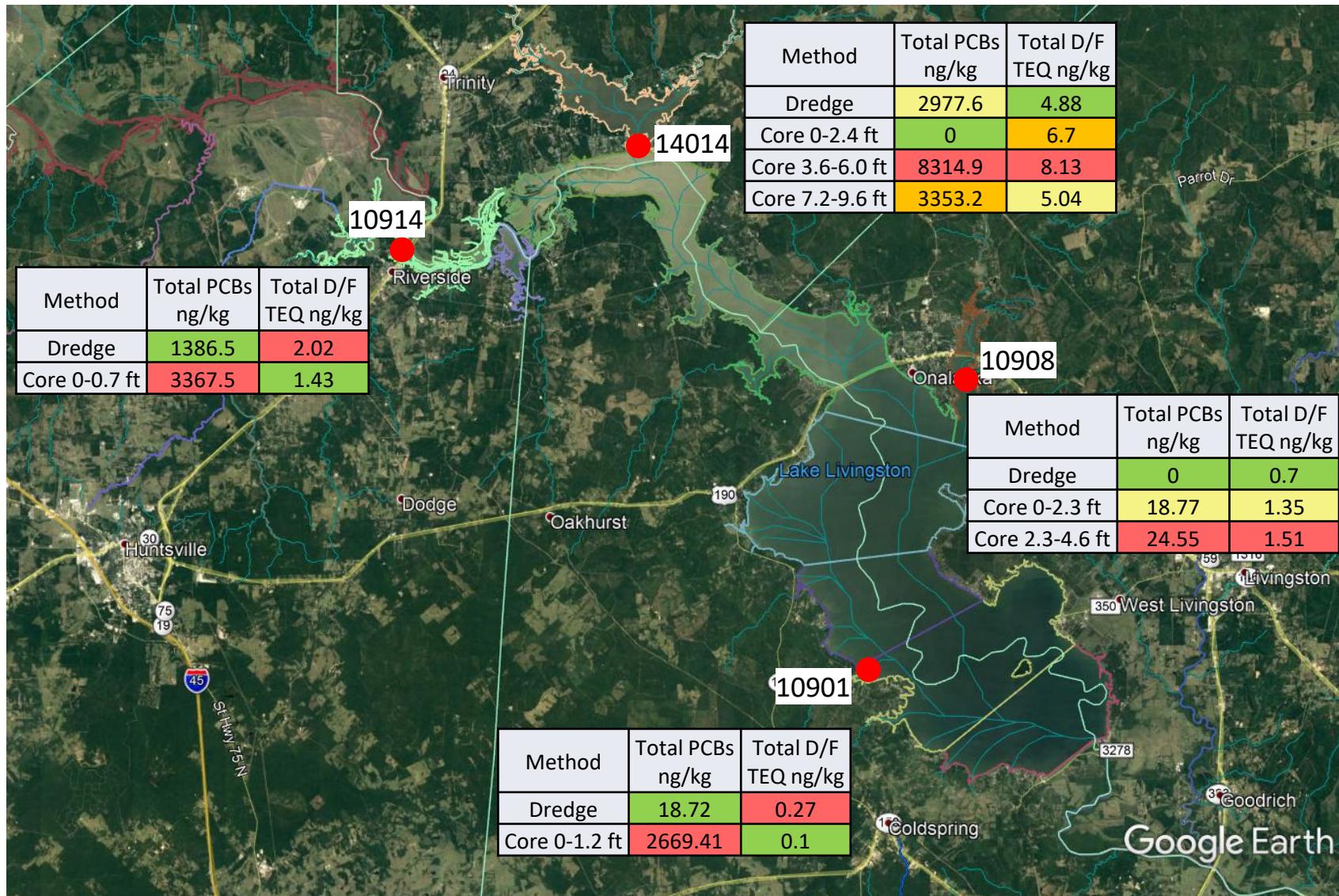


Lake Cores



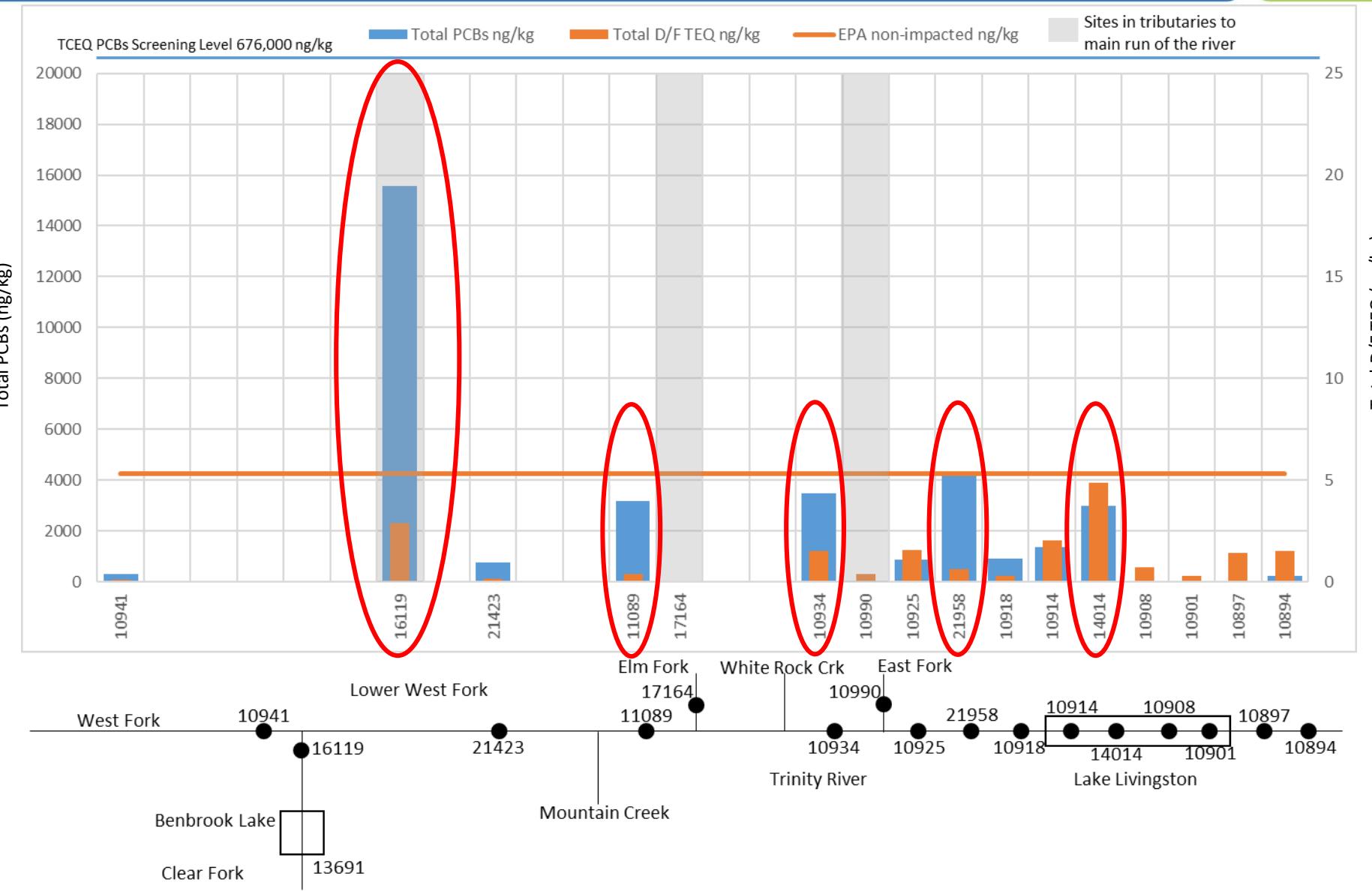


Lake Core Results

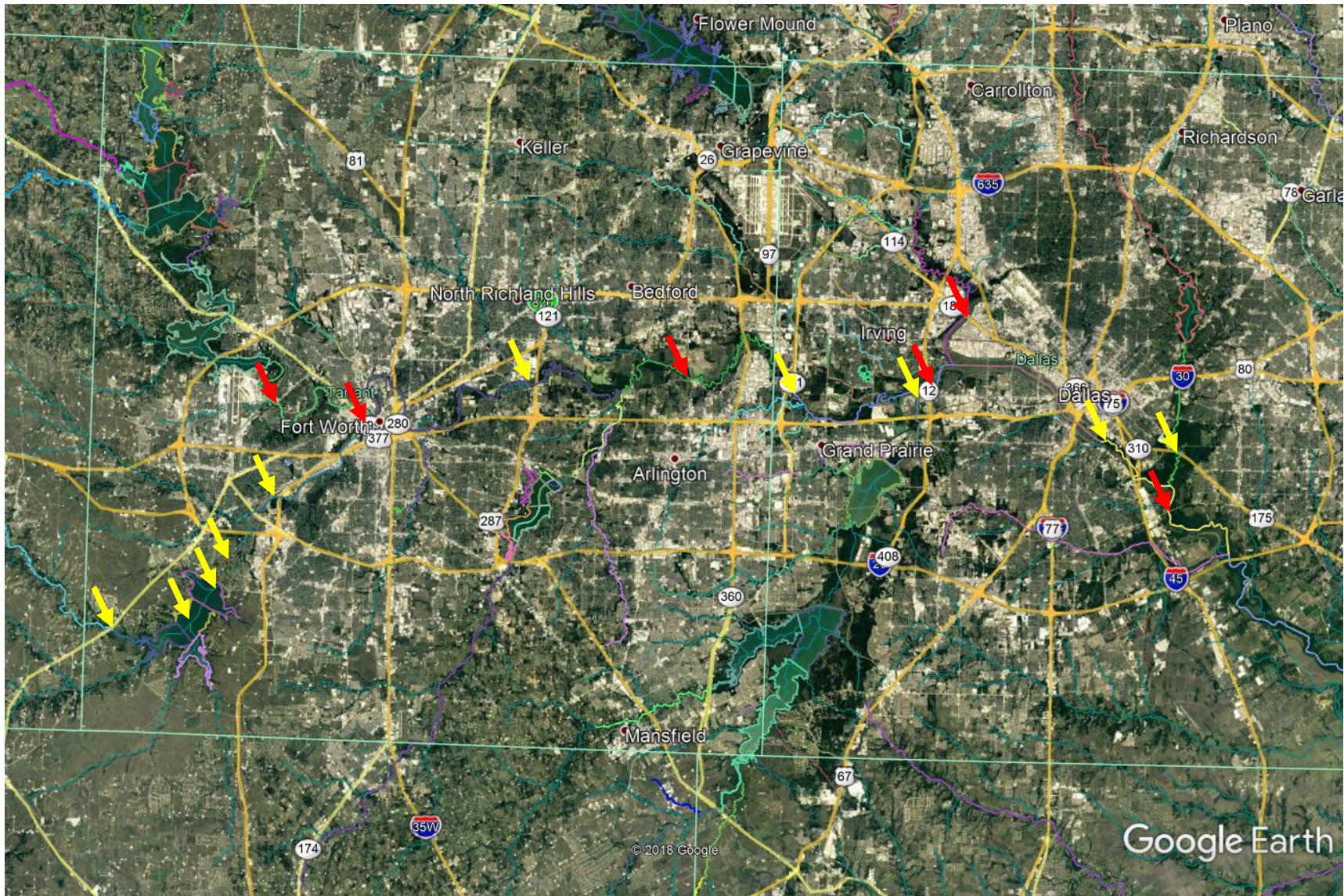




Phase 1 Results



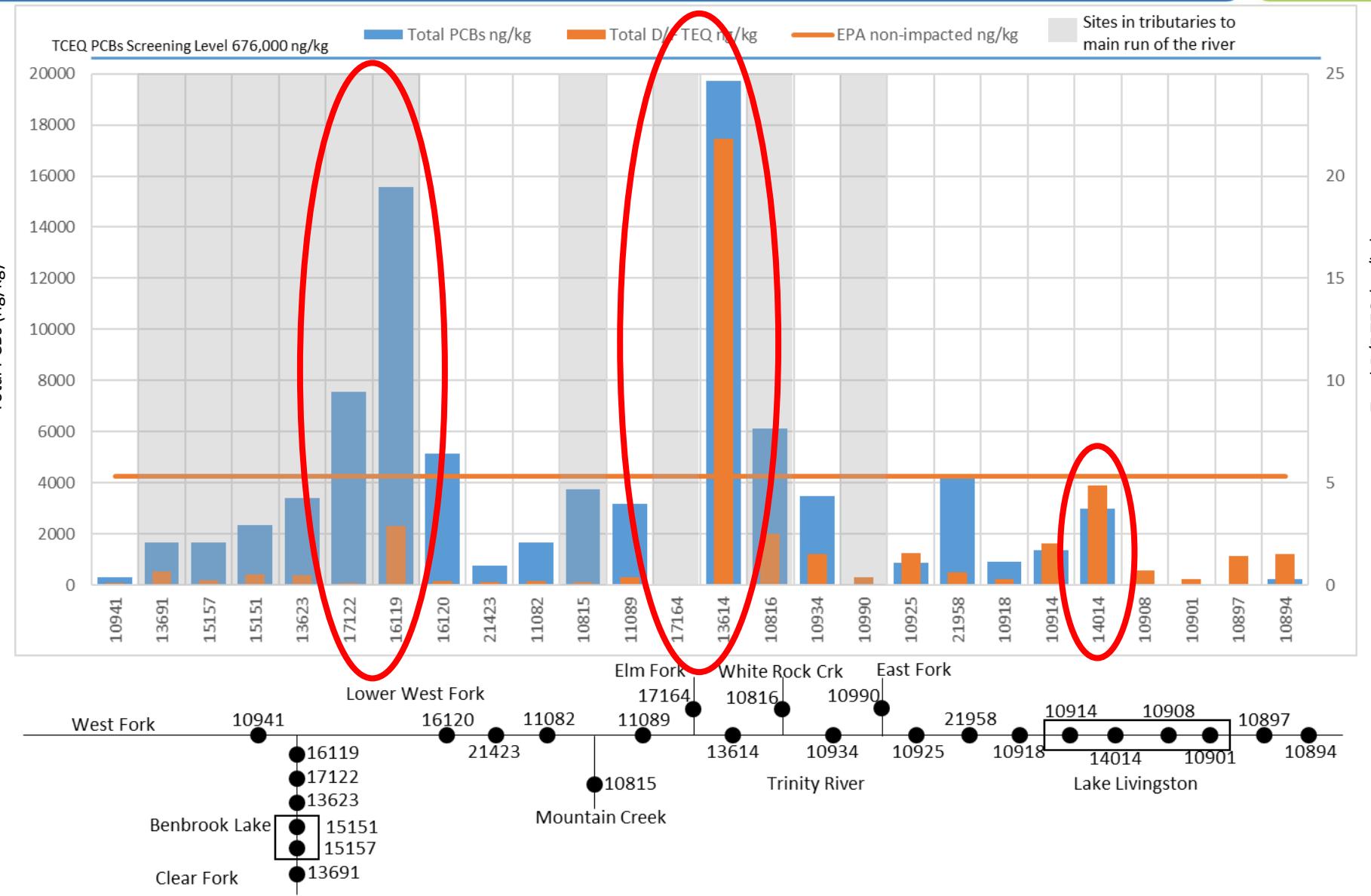
Phase 2 Sites



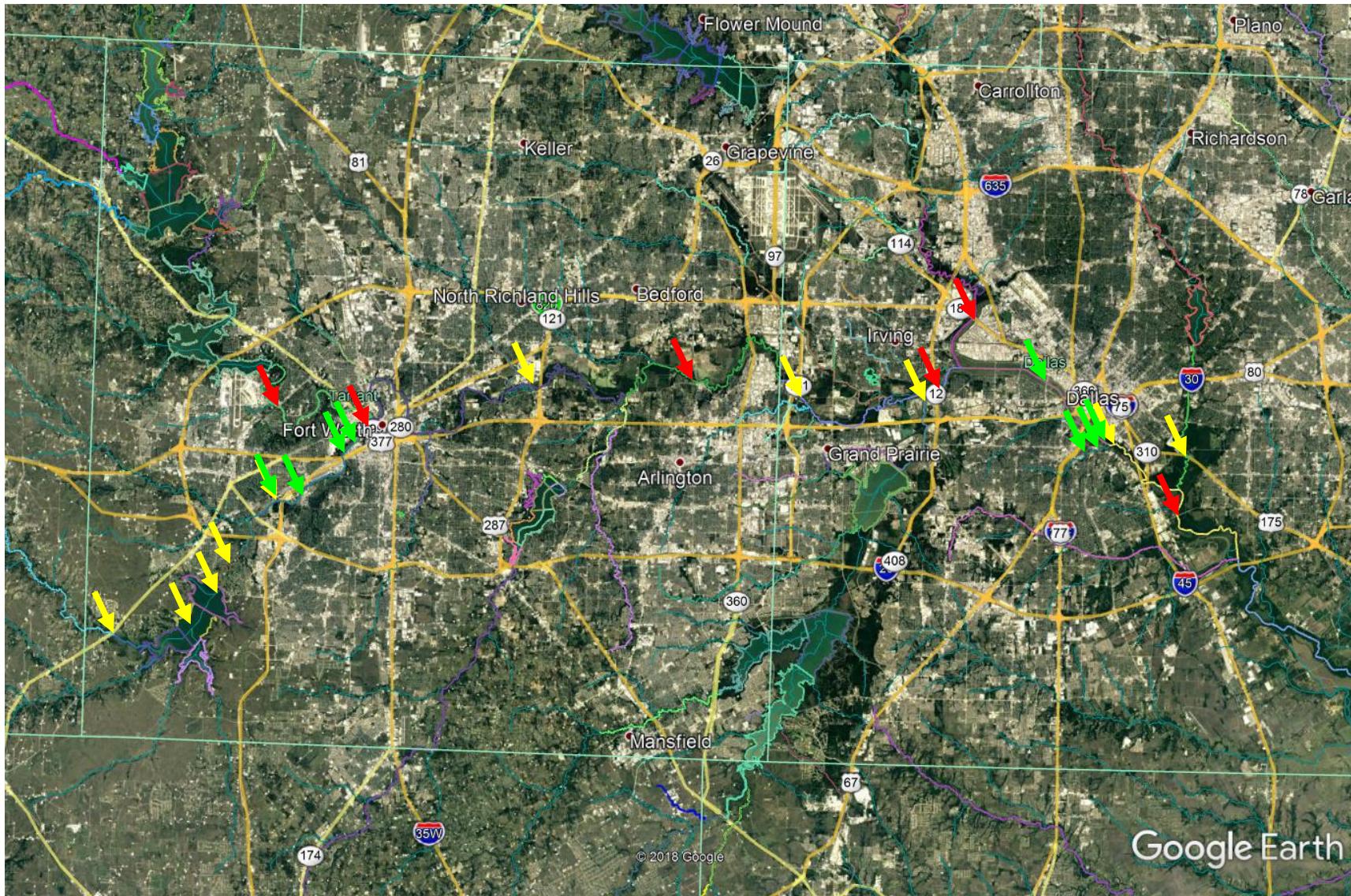
Phase 1 Sites

Phase 2 Sites

Phase 2 Results



Phase 3 Sites

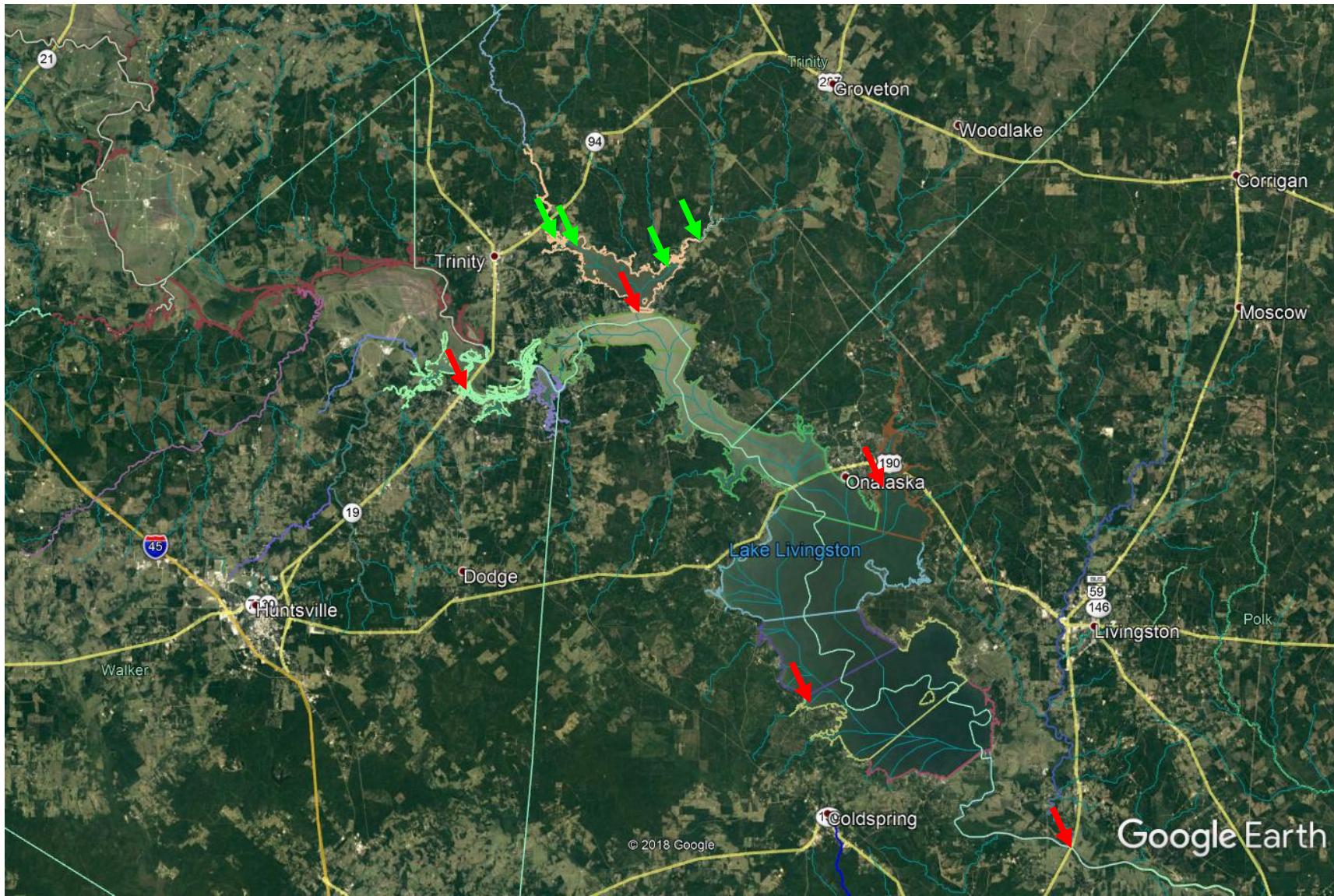


Phase 1 Sites

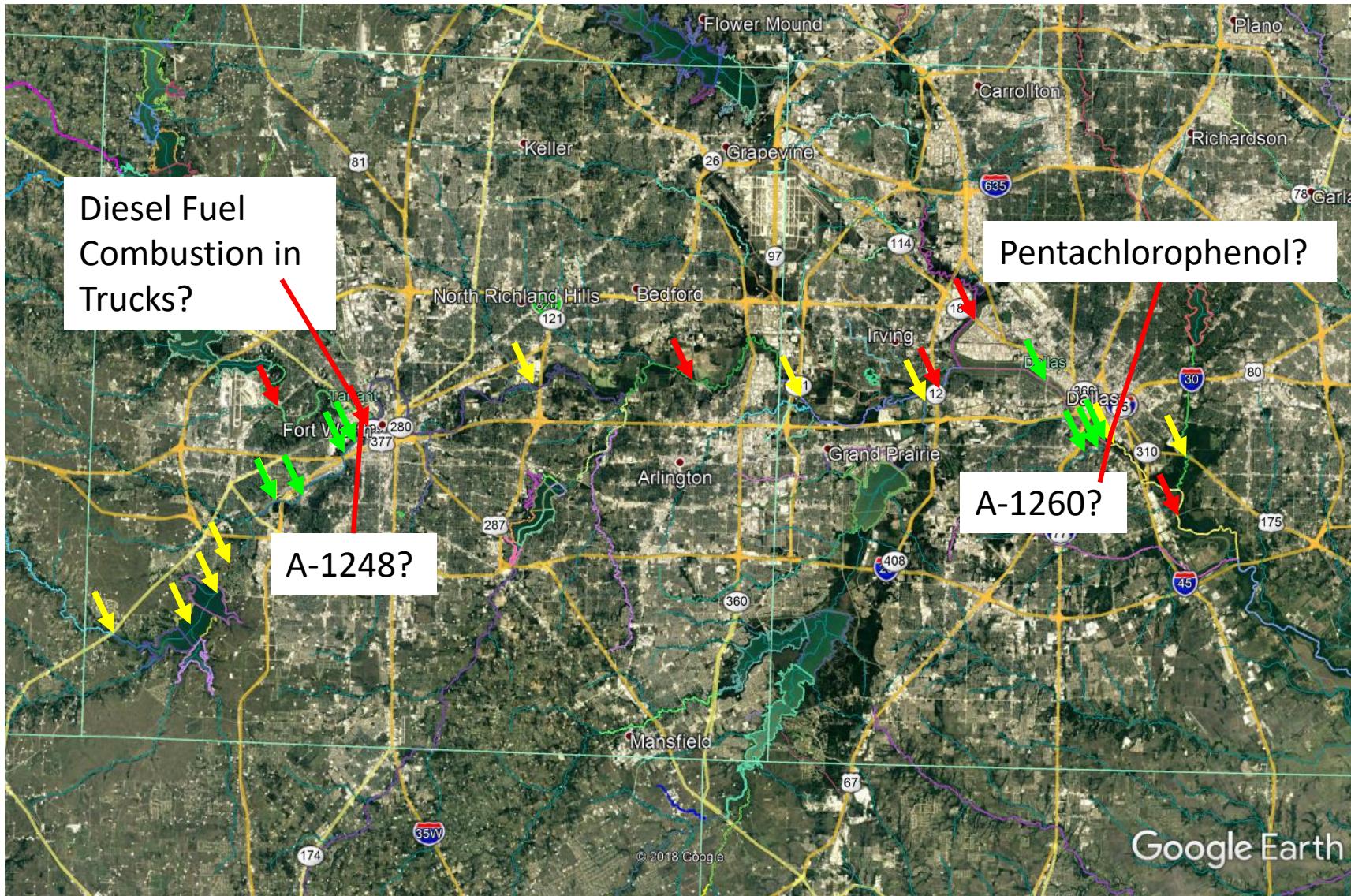
Phase 2 Sites

Phase 3 Sites

Phase 3 Sites



Phase 3 Sites

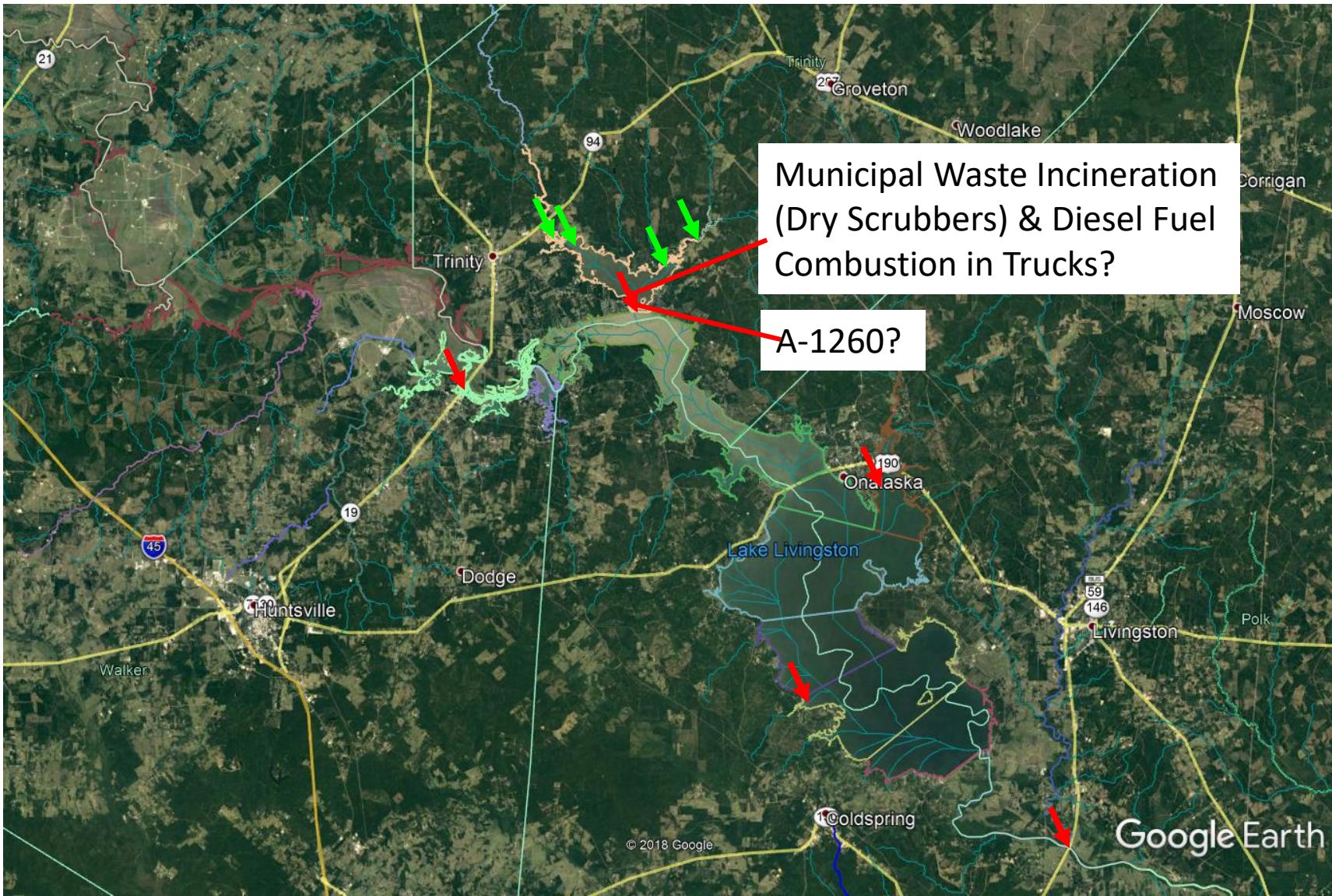


Phase 1 Sites

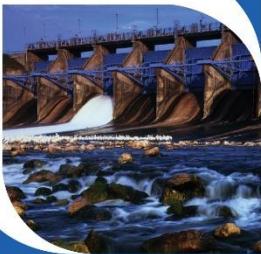
Phase 2 Sites

Phase 3 Sites

Phase 3 Sites

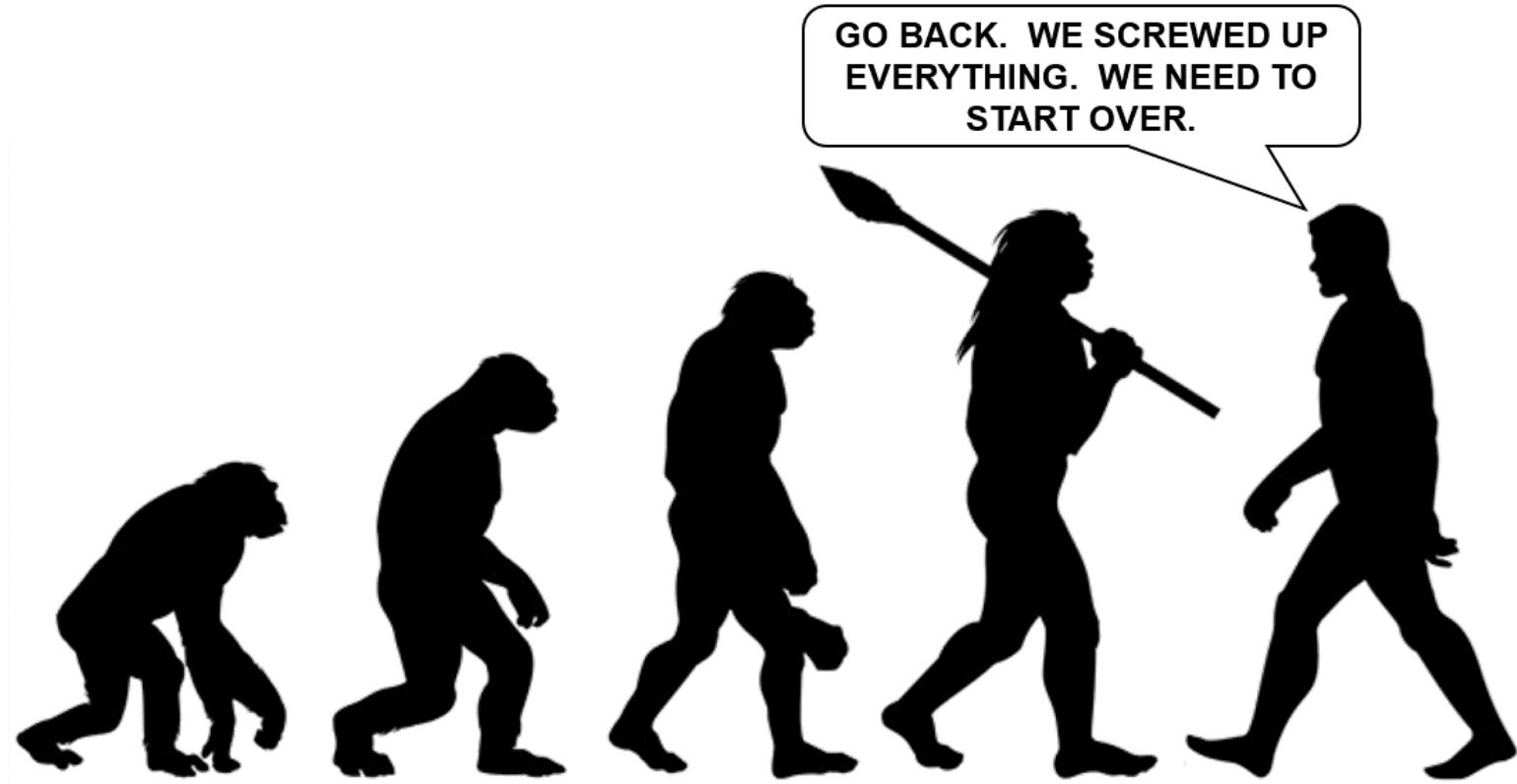


Next Steps





Questions



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817.493.5179